REMARKS

Status of the Claims

1-8 and 10-36, and 38-58 remain pending in the present application, Claims 1, 20, 28, 38, 39, and 43 having been amended, Claim 9 having been previously canceled, and Claim 37 having been canceled in this response.

Claims Rejected under 35 U.S.C. § 102(e)

Claims 1-5, and 8-19 are rejected as anticipated by U.S. Patent No. 6,485,413 (Boppart et al. – hereinafter referred to as "Boppart"). The Examiner maintains that Boppart discloses each of the elements of the claims rejected. Applicants respectfully disagree with this rejection for the reasons noted below.

In the interest of reducing the complexity of the issues for the Examiner to consider in this response, the following discussion focuses on independent Claims 1, 20, and 43. The patentability of each remaining dependent claim is not necessarily separately addressed in detail. However, applicants' decision not to discuss the differences between the cited art and each dependent claim should not be considered as an admission that applicants concur with the Examiner's conclusion that these dependent claims are not patentable over the disclosure in the cited references. Similarly, applicants' decision not to discuss differences between the cited art and every claim element, or every comment made by the Examiner, should not be considered as an admission that applicants concur with the Examiner's interpretation and assertions regarding those claims. Indeed, applicants believe that all of the dependent claims patentably distinguish over the references cited. Moreover, a specific traverse of the rejection of each dependent claim is not required, since dependent claims are patentable for at least the same reasons as the independent claims from which the dependent claims ultimately depend.

Patentability of Claim 1

In support of the rejection, the Examiner references Figure 4c, elements 58 and 94 of Boppart, as evidence of "an optical fiber attached to a cantilever," "wherein the cantilever serves as a waveguide." Applicants respectfully disagree with this characterization of what is shown in Figure 4c, since the Figure does not show a cantilever, and the description of Figure 4c provided by Boppart is contrary to the Examiner's assertion.

At col. 12, lines 35 – 46, Boppart describes Figure 4c as follows:

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> Referring to FIG. 4c, one or more movable wires or guides 90 are used to mechanically displace in a push/pull manner the fiber/lens unit in an arc about a pivot point 94. The movable wire 90 is housed within the cylindrical enclosure along with the single-mode optical fiber 58. The translation of the fiber/lens unit 63 is dependent on the point of attachment of the wire 90 with respect to the pivot point 94. If the wire 90 is attached close to the pivot point 94, then small displacements of the wire 90 will result in large arc displacements of the fiber/lens unit 63. Such a design may suffer from bending of the cylindrical enclosure 50 if such a mechanism is employed in a flexible enclosure.

In contrast, as amended above, Claim 1 recites "a cantilever comprising a fixed end and a free end, the fixed end remaining fixed to the substrate and the free end extending freely relative to the substrate, enabling the free end to bend and deflect in regard to the limited region of interest, the bending of the cantilever scanning light onto an image plane to create an image." Clearly, fiber/lens unit 63 of Boppart is not part of a cantilever that scans by bending, but instead, simply pivots about a pivot point 94 to scan in an arc. Figures 4b, 6b, and 7b of Boppart all show a cantilever arm 74 with a free end, but the free end of cantilever arm 74 supports a GRIN lens that is coupled to the end of a single mode optical fiber. The cantilever configuration of Boppart fails to meet the recitation of subparagraphs (c)(i) and (c)(ii) of Claim 1, which recite that the cantilever is configured as either "a waveguide that conveys light from the light source within the cantilever, when scanning the light onto the image plane to create the image," or as "a moving carrier for the light source that emits the light, the light source being mounted on the free end of the cantilever and moving when scanning the light emitted by the light source onto the image plane to create the image." Light is not conveyed by a waveguide ***within*** cantilever arm 74 in Boppart, and Boppart fails to teach or suggest ***a light source*** that emits light might be mounted ***on the free end*** of cantilever arm 74. Accordingly, it should be apparent that Boppart does not teach or suggest a cantilever like that recited in applicants' Claim 1.

In addition, Claim 1 has been amended so that subparagraph (c) now recites "a photon detector configured to receive light at a location that is proximate to the cantilever and to the support." Applicants disclose that a photon detector can be included for monitoring the displayed image and/or measuring motion of the cantilever scanner(s) (see page 12, lines 28-30 of applicants' specification). Also, in FIGURE 3, applicants illustrate photon detectors 224a and 224b that are integrated onto substrate 220, to directly receive light at a location proximate to the substrate and cantilever. In an alternative approach shown in FIGURE 6A, applicants illustrate a flexible optical

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fiber 256 that directs the received light through a coupler 258 to an optional semiconductor waveguide 260, which directs the light to one or more photon detectors 262, which are disposed proximally; however, the light is still received by flexible optical fiber 256 at a location that is proximate to the cantilever and substrate, to receive light reflected from a target 190.

Boppart does not teach or suggest any device equivalent to the photon detector now recited by each of applicants' independent claims. While col. 5, line 60 – col. 6, line 1 of Boppart discloses that "receiver processing unit 38 can consist of a single detector, dual-balanced detectors, or an array of photo-detectors," and that "the receiver processing unit 38 includes photo-detectors which received signals from the sample and reference reflections and detects any optical interference," there is no teaching of a photon detector that is configured to "receive light at a location that ***is proximate to the cantilever and to the support.***" Boppart fails to teach or suggest any light detector that responds to light received at a location proximate to a cantilever or to a support for a cantilever. Accordingly, for this additional reason, Boppart does not anticipate or suggest all of the recitation of Claim 1, and the rejection of Claim 1 as being anticipated by Boppart should be withdrawn.

Since dependent claims inherently include all of the recitation of the independent claim on which they ultimately depend, for at least the same reasons as noted above in connection with independent Claim 1, the rejection of dependent Claims 2-5, and 8-19 should also be withdrawn.

Claims Rejected under 35 U.S.C. § 103(a)

Claims 6 and 7 are rejected as unpatentable over Boppart in view of U.S. Patent No. 5,209,117 (Bennett). The Examiner acknowledges that Boppart does not teach a tapered cantilever, but relies upon Bennett for teaching a micro-machined cantilever and for teaching that tapered cantilevers are superior to rectangular cantilevers. However, Claims 6 and 7 ultimately depend from Claim 1 and are patentable for the reasons noted above. Thus, this rejection should be withdrawn.

Claims 20-24, 27-40, 42-45, 47-56, and 58 are rejected as unpatentable over Boppart in view of U.S. Published Patent Application No. 2004/0033006 (Farah). In regard to Claim 27, the Examiner notes that it is a product by process claim and does not add any limitation to the structure of the cantilever.

Claims 25, 26, 41, 46, and 57 are rejected as unpatentable over Boppart in view of Farah, as applied to Claims 20 and 43, and further in view of Bennett.

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The Examiner acknowledges that Boppart fails to disclose an image acquisition system configured as a micro-electro-mechanical system (MEMS), but asserts that "Farah discloses a system for an optical waveguide, as is used in the system of Boppart, and further discloses that it is known in the art that optical waveguide devices are typically made on silicon substrates." (See page 7, third paragraph of Office Action dated August 1, 2006.) She further asserts that "cantilevered film waveguides (paragraph 5) may be constructed as MEMS devices and fabricated on silicon wafers," and that "the MEMS structure includes a thick substrate and a thin piezoelectric layer, which constitute the thick and thin layers (paragraph 44)." The Examiner concludes that it would have been obvious to modify the disclosure of Boppart in light of the disclosure of Farah, to configure Boppart's apparatus as a MEMS device. Applicants respectfully disagree for the reasons noted below.

Patentability of Claim 20

Farah teaches a silicon optical waveguide. Paragraph 5 of Farah further teaches that in certain applications, it is desired "to incline the end faces of cantilevered film waveguides relative to the axis of the waveguide, especially at air gaps between cantilevered and fixed waveguides." Farah does not teach or suggest the use of silicon cantilevers or cantilevers in any MEMS device for scanning light relative to a target and does not teach or suggest enabling the free end of a cantilever to ***bend and deflect relative to the substrate and the limited region of interest, for scanning with the free end of the cantilever relative to the target***." Instead, Farah indicates driving the cantilever for use in a Mach-Zehnder interferometer (see Example 1), or in an interferometric accelerometer or optical switch (see Example 2), which are entirely different functions for a MEMS waveguide device cantilever than the scanning function recited in applicants' claims. Accordingly, it is clear that a person of ordinary skill in the art would NOT be led to modify Boppart to include a MEMS cantilever, since Farah does not teach or suggest that a MEMS cantilever might be used for scanning relative to a target. Only through hindsight, based upon the teaching of applicants' application, might it now appear that a MEMS cantilever could be employed in the apparatus disclosed by Boppart, since substantial modification would be required of the Boppart apparatus to employ a MEMS cantilever, and since Farah does not teach how a cantilever might be employed for bending and deflecting, for scanning relative to a target.

In addition, as discussed above in connection with Claim 1, Boppart (and the other cited art) fail to teach or suggest "a photon detector configured to receive light at a location that is proximate to

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the cantilever and to the support." Accordingly, it will be clear that Claim 20 also patentably distinguishes over the cited art for this reason, as well. Since dependent claims inherently include all that is recited in the independent claim from which they ultimately depend, Claims 21-36, and 38-42 (Claim 37 having been canceled above) are patentable for at least the same reasons as independent Claim 20.

Patentability of Claim 43

In Claim 43, subparagraph (a) recites "forming a cantilever on a substrate." Subparagraph (c) recites "supporting the cantilever at a fixed end of the cantilever, the fixed end remaining fixed to the substrate, a free end of the cantilever extending freely beyond where the portion of the substrate was removed from supporting the cantilever, enabling the free end to bend and deflect relative to a target in the limited region of interest, for scanning the target." As noted above in the traverse of the rejection of Claim 20, Farah fails to teach or suggest how a cantilever formed on a substrate can be configured to carry out the function of "scanning a target" and does NOT teach or suggest any related scanning function for a cantilever that is formed on a substrate. Thus, there is no reason why one of ordinary skill in the art would understand how the cantilever disclosed for entirely different functions and configured in an entirely different manner in Farah might be employed in the apparatus of Boppart. Even applicants find it difficult to understand how the cantilevers shown and discussed by Farah might be modified for use in scanning a target.

In addition, as amended, Claim 43, subparagraph (e) now recites "receiving light at a location that is proximate to the cantilever and to the support." For the same reasons discussed above in connection with applicants' traverse of the rejection of Claim 1, it will be apparent that Boppart does NOT teach or suggest any component or function corresponding to receiving light at a location that is proximate to a cantilever and a support on which the cantilever is formed. Accordingly, Claim 43 is also novel and non-obvious over the cited art and the rejection of this claim should be withdrawn. Since dependent claims are patentable for at least the same reasons as the independent claim on which they ultimately depend, Claims 44-58 are also patentable over the cited art, and their rejection should be withdrawn.

Based upon the preceding Remarks, it should be clear that all claims remaining in the present application are patentable over the art cited. This case should thus be passed to issue without further

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delay. In the event than any question remains, the Examiner is asked to telephone applicants' attorney at the number listed below.

Respectfully submitted,

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